DOCUMENT RESUME

ED 071 197 EA 004 806

AUTHOR Brown, Edward K.
TITLE Qualititive and Quantitative Allocations of Program Funds in a Non-Profit Institution.
PUB DATE [72]
NOTE 18p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Academic Achievement; *Budgeting; Costs; *Decision Making; Educational Finance; Educational Planning; Expenditure Per Student; Expenditures; Models; *Planning; Program Budgeting; *Programing; Program Planning; *Resource Allocations

ABSTRACT

Through a generalized application of the principles of programing-planning-budgeting (PPB), a process was devised for describing the methods of resource allocation in a nonprofit institution. By categorizing pupil service inputs according to basic skills, instruction, and supportive services it became possible to identify meaningful service input components. Each component was found to be contiguous with one of four assessed pupil need categories and, thereby, represented service-delivery units (SDUs). Assessments of the allocation procedures showed that (1) the functional cost of the SDUs was dependent on the levels (proportions) of resource inputs they contained, (2) significantly different proportions of resource inputs were associated with the SDUs, and (3) SDU data could be used to predict the level of finance that would be needed to improve the output of each SDU. Study findings suggest that the modified PPB is a viable system for quantifying program allocation procedures and for ascertaining what combination of school service inputs are most influential in maximizing school achievement. (Author)

FILMED FROM BEST AVAILABLE COPY

ED 071197

QUALITATIVE AND QUANTITATIVE ALLOCATIONS OF PROGRAM FUNDS IN A NON-PROFIT INSTITUTION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

Edward K. Brown

Office of Research and Evaluation
School District of Philadelphia

The application and use of programming-planning-budgeting (PPB) principles in educational decision-making processes have not occurred as rapidly as they have in other institutions. Some authors have attributed this lag to the length of time it takes to implement such systems.[1] Others have suggested that the usefulness of PPB information in educational decision-making has not been demonstrated.[2] To encourage the use of PPB in instructional decision-making processes, a simplified method was devised to show the relationship between instructional resource inputs and pupil achievement outcomes.

Two recent HBR articles[3,4] have shown that the principles of PPB can be applied successfully to a wide range of program needs. In the cases mentioned, the authors choose to use broad operational definitions to define and classify the key components of their organizations. Such definitions made it possible for them to develop meaningful units of program operations and financial expenditures. Once having these units, they were able to develop meaningful management information which dramatically improved the output of their organizations. As was the case in the previous HBR articles, this article will demonstrate how PPB principles may be used (a) to obtain a better understanding of the relationships between program expenditures and pupil achievement output and, thereby,

EA 004 806

(b) improve the impact of such expenditures on instructional practices. To facilitate the assessment/evaluation process for this study, the major sources of instructional inputs were reduced to three pupil service components. The article will consist of three parts. The first part will describe the three pupil service components (PSC). The second part will summarize the results of a study in which the PSC were used. The third part will show how the findings of the study led to the discovery of a new functional dimension associated with the outcomes of instructional program expenditures.

Pupil Service Components (PSC)

To describe the nature of the services delivered to pupils through instructional program funds, three service-categories were developed: basic skills, instructional other (than basic skills), and supportive services.

Basic Skills (BAS). This component characterizes those services and materials which have direct applications to the improvement of pupil achievement in reading and arithmetic.

Instructional Other (IO). This component characterizes those services and materials which have direct applications to the improvement of pupil achievement in subject areas other than BAS. The inputs of this component also encompass the affective and cultural aspects of education.

Supportive Services (SUP). This component characterizes those personnel and material supports (1) which improve the instructional practices within a school and (2) which encourage the participation of parents and the community in the educative processes of the schools.

Programmatic Input Models

In a recent study of the impact of 16 ESEA, Title I projects on 63 elementary schools and their pupils in Philadelphia,[5] four programmatic input models were identified: Educational and Cultural Enrichment Experiences, General Instructional and Supervisory Support System, Intensive Instructional and Supervisory Support System, and Remediation Programs. These classifications or specific programmatic thrusts were derived (a) after an analysis of the number and kinds of PSC that were operational within each model and (b) after an assessment of the relationships between pupil educational needs and the applied instructional strategies of each model had been made. A description of each model is given in Table 1.

An impact component analysis was performed for each model to determine (a) whether the input variables (the pupil service components, pupil achievement characteristics, school funding levels, and assessed pupil needs variables) were reenforcing the central theme of each model and (b) whether the configurations of the impact variables were producing the expected outcomes. The results showed that each model had a high level of internal consistency. Measurements of the effects of the programmatic inputs on pupil outputs showed that the highest level of pupil achievement occurred in Model 1; whereas, small positive gains occurred in Models 2, 3, and 4. Of the six proposed alternatives to improve the achievement outcomes of each model, alternative #1* gave strong indications that planned expenditures of program funds to improve achievement

*Alternative #1. Redistribute the levels of pupil service components (PSC) expenditures within each model (p. 78).

TABLE 1

Elementary School Implementation Models

PROGRAMMATIC INPUT

Model 1	Model 2	Model 3	Model 4
Educational and Cultural Enrichment Experiences	General Instructional and Supervisory Support System	Intensive Instructional and Supervisory Support System	Remediation Programs
This level of program expenditure is directed toward the improvement of a pupil's awareness of his own and other social cultures, and an appreciation for the aesthetic qualities of life. The combination of IO and SUP projects indicates a systematic program input for increasing the affective contributions and qualities of education by improving the teacher's capability to understand and utilize changes in pupil attitudes (self-perception) as a means for motivating the pupils to perform at their potential.	This level of program expenditure is directed toward the improvement of instructional programs at all elementary grades. The thrusts of the model are directed toward the use of the community, supervisory personnel, and additional instructional programs. The combination of IO and SUP projects indicates a systematic program input for improving those factors which influence the quality of instruction. The increased number of projects indicate a higher level of supportive materials and personnel are made available to the schools. The objective of these additional expenditure is to improve the teachers' capacity to diagnose and manage classroom instructions.	This level of program expenditure is directed toward the improvement of instructional practices and supervision--particularly in the area of basic skills. The thrusts of the model take the form of instructional aides and supervisors. The combination of BAS, IO, and SUP projects indicates a systematic program input for improving all educative factors which influence pupil performance. The expenditure pattern emphasizes a major investment in supportive materials and personnel as well as a focus on the improvement of the teachers' ability to teach the basic skills. To assist in instructional management, instructional aides are provided to most schools.	This level of program expenditure is directed toward the establishment of permanent basic skill centers and systems which provide a continuous exposure to (a) individualized instructions, (b) a concentration of new and (c) an increased involvement of school and community support systems. The combination of BAS, IO, and SUP projects indicate a systematic program input for improving all educative factors which influence pupil performance. The decremental changes in the expenditure pattern represents an effort to maximize instructional inputs for the improvement of the basic skills. This level of BAS expenditure permits the establishment of Instructional Skill Centers where the learning disabilities of the children are diagnosed and where individualized, corrective programs are prescribed.

outcomes should proceed in two distinct steps--the first qualitative; the second quantitative.

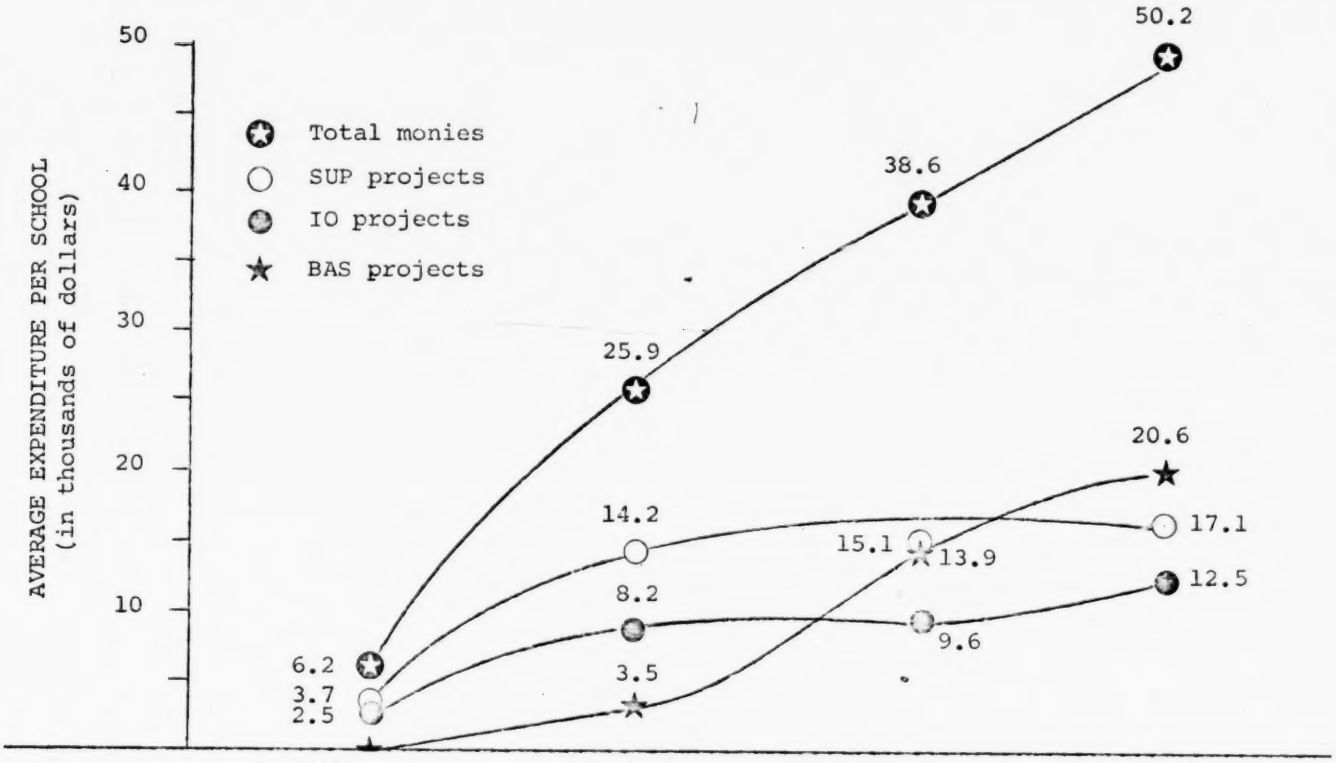
Qualitative Expenditures

Qualitative judgments, concerning the level of expenditures for pupil service components, are made in terms of placing specific Title I projects in schools which demonstrate a need for the service-activities described by each project's goals and objectives. Each project is developed and implemented in accordance with those instructional and/or service inputs which fall (a) within the jurisdiction of specific curriculum areas and (b) within the guideline of Federal Programs. However, the number and combination of such projects to a school depend upon (1) the needs of the pupil population in the school, (2) the judgment of a school district's management, and (3) the resources that are available to a school district.

The efficacy of the projects developed and instituted within a given school district is ascertained through a number of immediate and longitudinal evaluations performed by the Research and Evaluation unit[6] of the school district. Modifications from the original project's design are made as a result of the information obtained through such evaluation procedures. As indicated earlier, the impact component analysis technique was devised to determine whether the configuration of projects placed within the schools formed a unique subset of programmatic inputs which systematically improve the academic success of the children they serve.

As is shown in Figure 1, the qualitative expenditure for projects or the investment of project services is represented by the total monies

Figure 1. Consolidated illustration of the programmatic inputs, achievement characteristics, pupil need-assessments, and categorical expenditure ratios of the four Implementation Models.



MODELS	1. Cultural & Enrichment Experiences	2. General Instructional & Supervisory	3. Intensive Instructional & Supervisory	4. Remediation Programs
ACHIEVEMENT GROWTH DIFFERENTIAL*	2.8	2.2	1.8	1.8
PUPIL NEEDS ASSESSED	Positive attitudes toward self, school, cultures, employment potential	Alternative methods or strategies for learning	Involvement in well-defined, well-managed programs for basic skills development	Individualized instruction
Ratio of Component Expenditures (BAS:IO:SUP)	0 : 1 : 1.3	1 : 2.3 : 4.1	1.4 : 1 : 1.6	1.6 : 1 : 1.4

*Difference between the average score of sixth- and third-grade pupils at the same school.

allocated to the schools within each model. One sees in the figure that the total funds allocated to the schools within the model (a) vary inversely to the amount of progress made by the pupils (viz., Achievement Growth Differential) and (b) vary directly with the level and kinds of instructional procedures or strategies that are needed to improve the performance of the designated pupils. Likewise, one can see by studying the ratio of expenditures for pupil service components which components are emphasized in characteristics of the programmatic inputs.

For example, in Model 1 (Cultural and Enrichment Experiences), the average total fund allocated to its schools is $6,200. Of this amount, $3,700 is spent for Supportive Services (SUP) projects and $2,500 for Instructional Other (IO) projects. The thrust of the investment of projects is to assist the pupils in gaining more positive attitudes toward themselves, the school, their's and other's cultures, and their employment potential. It is believed that the attainment of these goals will motivate pupils in Model 1 to perform at their potential levels. It would appear that an Achievement Growth Differential (AGD) score of 2.8 grade equivalent years (on a standardized test) over a three school-year period, substantiates the expenditures for the model's strategy.

At the other extreme, one notes that in Model 4 (Remediation Programs), an average investment of projects to the value of $50,200 is spent in the schools. When the total monies are partitioned into the three PSC service units, one observes that an average of $20,600 is spent for BAS; $17,100 for SUP; and $12,500 for IO. Therefore, the ratio of pupil service component expenditure is greater for BAS (1.6) and SUP (1.4) than for IO (1.0). Moreover, these expenditures appear to be consistent

with the kinds of instructional needs the pupils within this model exhibit--a need to have individualized instructions. The levels of expenditures are further justified by the fact that the average pupil in this group gains only 1.8 grade equivalent years of knowledge in three years of schooling.

In summary, one sees from this figure that the qualitative procedures used to ascertain and allocate the levels of invested projects to the schools are valid and reliable in terms of the general programmatic needs of the designated pupil populations.

Quantitative Expenditures

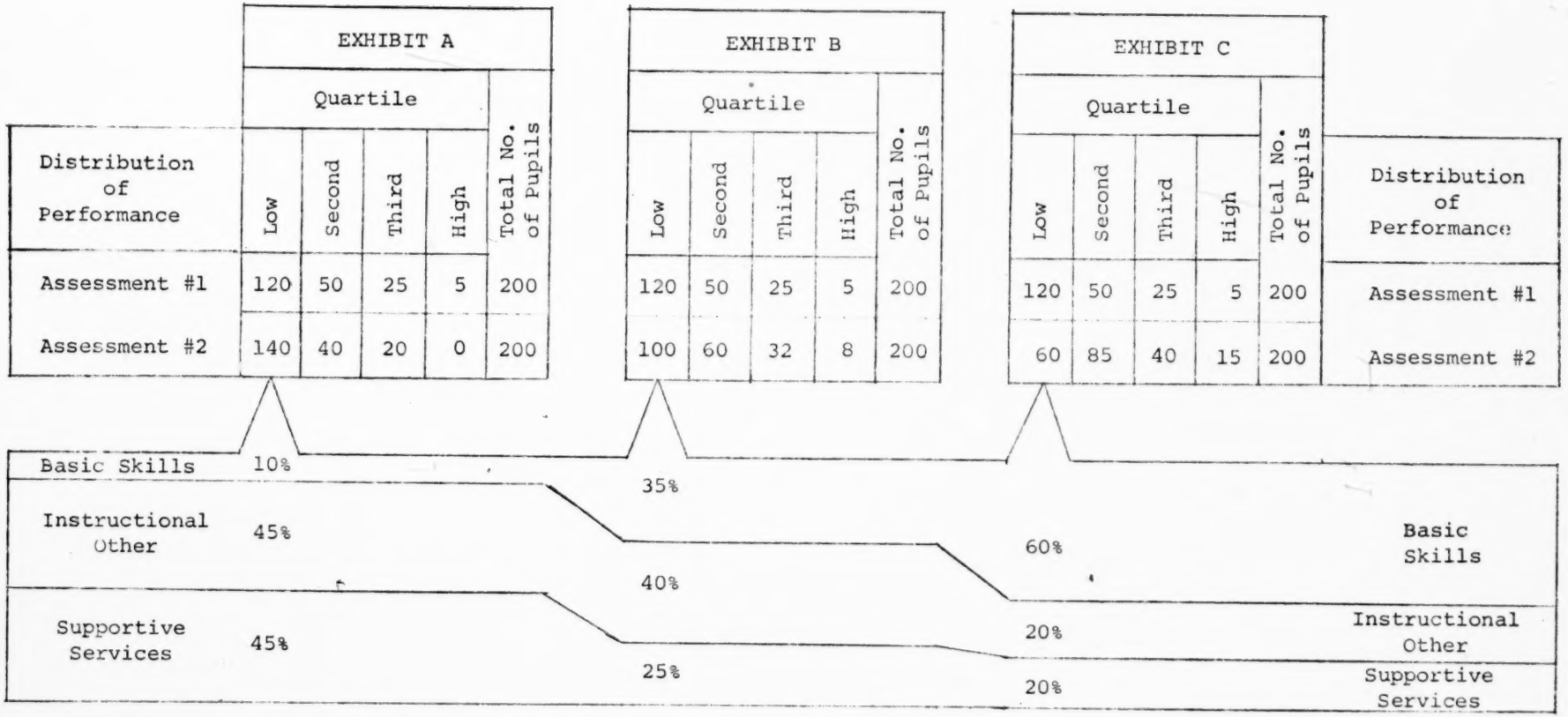
Once an assessment of the qualitative expenditure patterns has been made, it is possible to enter into the second level of program planning and budgeting. It was noted in the qualitative expenditure procedure that the actual expenditure of program funds was realized as an investment of project services which were designed to improve specific pupil needs. Under this investment of project concept, the monies allocated to each programmatic model were represented through the following project service indices: Model 1 = 1 or 2 projects; Model 2 = 3 or 4 projects; Model 3 = 5 or 6 projects; Model 4 = 7 or 8 projects.

A review of the actual data showed that although the project service indicies were constant across a given model, the distribution of the pupil service components (i.e., BAS, IO, SUP) varied considerably. The greatest variation of pupil service components occurs in Model 4, since it receives the greatest level (number) of project services. For example, one could find schools within the model which had as much as

60% of its total funds invested for BAS services, and others having only 10%. For IO services, one could find expenditures as high as 45% and as low as 20%. For SUP services, one could find expenditures as high as 45% and as low as 20%.

When the achievement data of schools having systematically different proportions of expenditures for the three PSC were analyzed, one found that the performance of the pupils, in each case, was significantly different. To illustrate the effects that were noted in the actual study, three exhibits were prepared and are presented in Figure 2. Exhibit A represents the condition where the PSC expenditure pattern was 10% for BAS, 45% for SUP, and 45% for IO. Exhibit B represents the condition where the expenditures were 35% for BAS, 40% for SUP, and 25% for IO. Exhibit C represents the condition where the expenditures were 60% for BAS, 20% for SUP, and 20% for IO.

Given that the investment pattern in Model 4 were $50 per pupil and that 200 pupils were present under each of the three conditions, one finds that a total investment of $10,000 was made to each condition. Since the performance characteristics of the pupils in this model is below national expectations, one finds that of the 200 pupils assigned to the Exhibits, 120 or 60% or them fall within the lowest performance quartile. Since the thrust of Model 4 is toward remediation through the individualization of instructions, the invested project services are focused on the pupils in the low quartile--as is indicated by the heavy arrow in the figure. Therefore, six of the ten thousands of dollars invested are immediately earmarked for this target group in each of the



Investment Pattern	$50/pupil = $10,000 Total = $ 6,000 Target Group	$50/pupil = $10,000 Total = $ 6,000 Target Group	$50/pupil = $10,000 Total = $ 6,000 Target Group
Change in Performance	Gained 20 pupils (+16%) in the Target Group	Moved 20 pupils (-16%) from the Target Group	Moved 60 pupils (-50%) from the Target Group
Charge Cost: Target Expenditure ÷ No. Pupils Moved	Investment Loss: $7/pupil $\frac{120}{140}$ X $50 = $43/pupil	$\frac{\$6,000}{20}$ = $300/pupil	$\frac{\$6,000}{60}$ = $100/pupil
Pupil Investment: Pupil Charge	$50 : $43 = 1 : -1.2	$50 : $300 = 1 : 6	$50 : $100 = 1 : 2

Figure 2. Effects of proportional expenditures for BAS service components on pupil progress in reading in Model 4 schools receiving equivalent levels of program funds. Source:

conditions described above.

At assessment point #2, an analysis was performed to determine what effect the individual conditions had on the performance of the target group. The data showed that (1) in condition A, twenty (20) additional pupils were added to the target group; (2) in condition B, twenty (20) pupils moved from the low quartile into a higher quartile; and (3) in condition C, sixty (60) pupils moved from the low quartile to a higher quartile (see Figure 2).

As shown in the figure, change costs were calculated for the three conditions. It was found that in condition A, a net loss of $7.00 per pupil was incurred, since the condition ended with more pupils than it had originally. In condition B, a cost of $300.00 was required to move each pupil from the target group. In condition C, a cost of $100.00 was required to move each pupil from the target group. To obtain an estimate of how well the initial investment met the outcome costs, an investment/change ratio was developed for each condition. These ratios showed that under the two conditions where positive changes were observed, two and six times the original investment were required to produce pupil progress in the target groups.

Functional Dimensions of Program Expenditures

Since it was observed (1) that the proportions of monies spent for specific PSC services within the schools of Model 4 produced significantly different pupil performance outcomes and (2) that as the number of pupils leaving the target group increased, the per pupil change-cost began to approach the initial investment cost, it was hypothesized that a

functional relationship should exist between the proportions of monies invested as BAS services and the proportion of pupils who could be expected to move from the designated target group. The plot of the coordinate pairs from Exhibits A, B, and C, is shown in Figure 3. Each point represents the percent of monies invested as BAS services in an exhibit and the percent of pupils who moved from the target group as a result of the BAS expenditures. Accompanying each point is its appropriate change-cost ratio. The figure also shows that if the ratio of expenditures for BAS services in Model 4's schools were 3.6 times that of the total expenditures for IO and SUP services, all of the pupils in the target group could have been moved into a higher quartile. Furthermore, it shows that when the expenditure for BAS is 3.4 times as great as that for the others, the pupil change-cost ratio would be equal to that of the initial per pupil investment ($50/pupil).

Although it appears that a mathematical solution could be used to achieve the goal of the invested capital--to improve the reading performance of 120 elementary school pupils at or below the 25th National percentile as evidenced by their movement into a higher quartile at an investment rate of $50.00 per pupil, the curvilinear function shown in Figure 3 indicates that the Law of Diminishing Returns begins to operate when BAS expenditures are twice that of IO + SUP. This phenomenon appears to be supported by the fact that when IO and SUP levels are extremely low, the classroom management of instructional programs becomes less effective.

A more rational solution to the problem would be to reconsider the level of per pupil and total investments. Figure 4 summarizes the

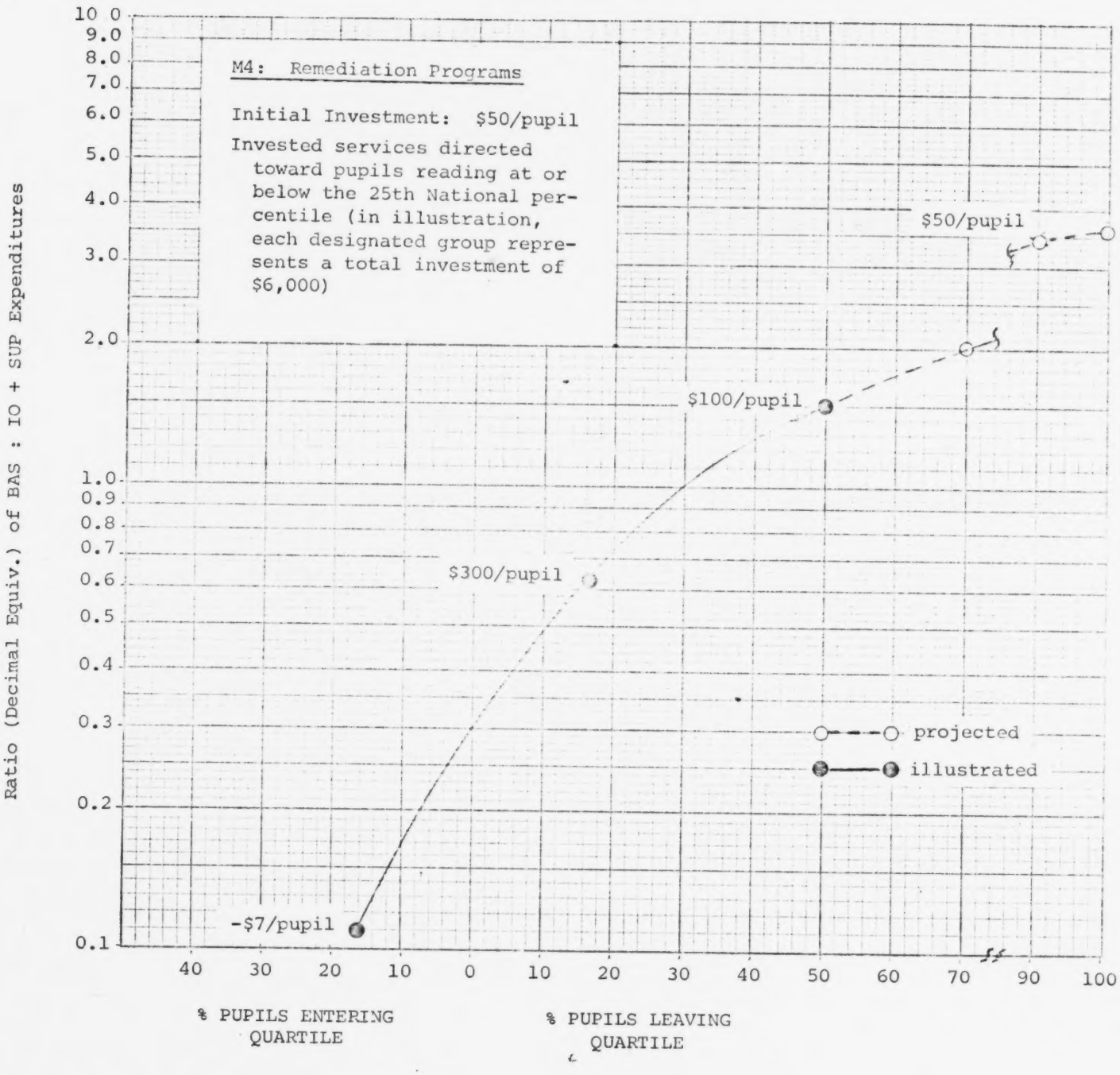


Figure 3. Effects of proportional expenditures for BAS service components on pupil progress in reading in Model 4 schools receiving equivalent levels of program funds. Source:

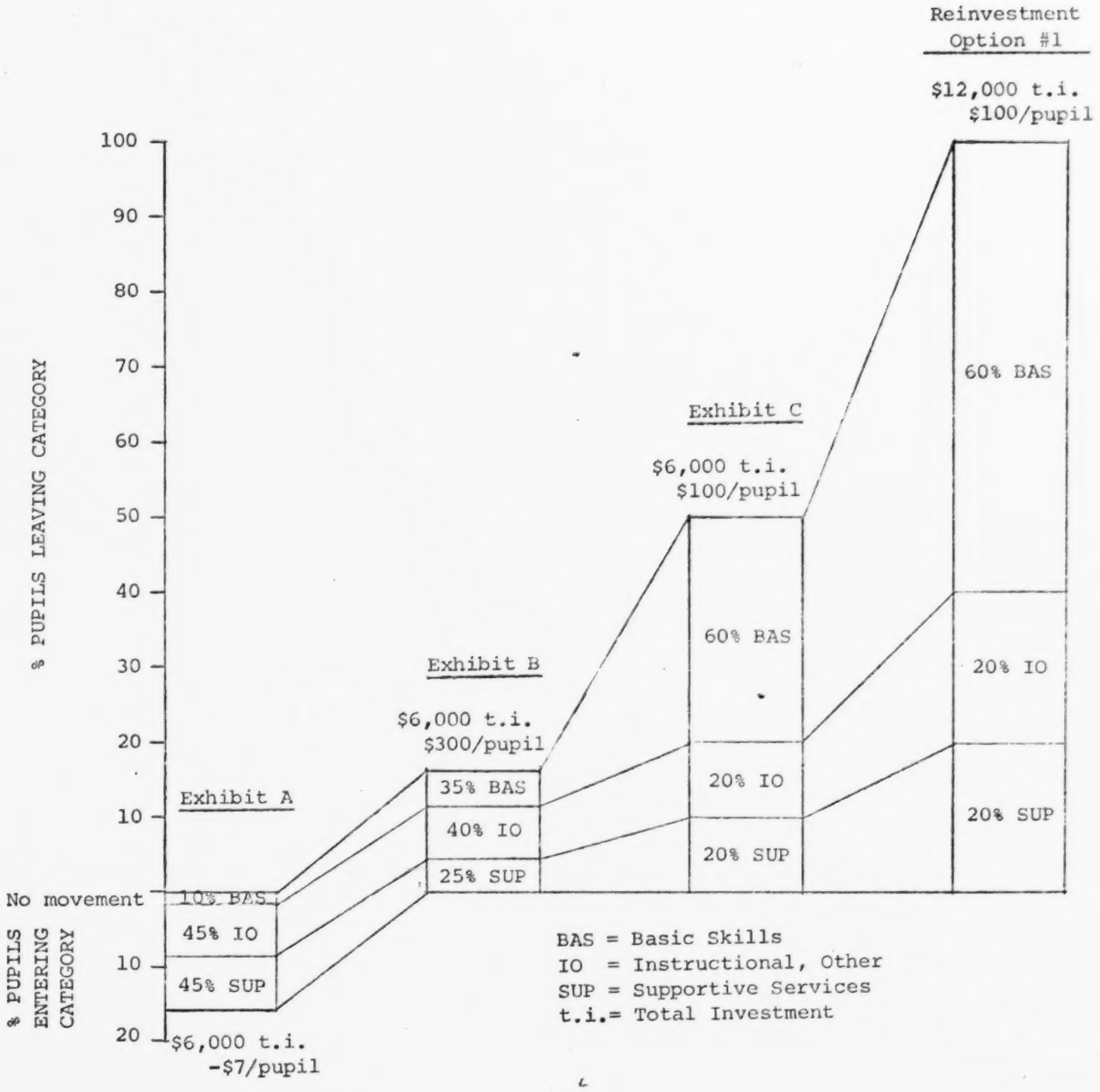


Figure 4. Systematic effects of the level of pupil service expenditures within a constant investment total on the reading achievement performance of pupils at or below the 25th national percentile, accompanied by a projected reinvestment plan.

salient facts that are needed to substantiate a proposed decision. The data provided for Exhibits A, B, and C represent not only the proportions of monies spent in each PSC, but also the actual costs that are associated with the observed changes in pupil performance. Likewise, the heights (proportion of pupil change) of the exhibits reflect the percentage of pupils who were moved from the low quartile by the realized costs of the initial investment.

A most realistic option for this increased investment would be at the level of $100 per pupil since the data indicated that this level of expenditure moved 50% of the target population out of the 25th National percentile. As shown in the figure, Reinvestment Option #1 recommends that the total investment (t.i.) be increased from $6,000 to $12,000, thereby producing a per pupil expenditure of $100 ($12,000 ÷ 120 pupils = $100 per pupil). Moreover, this option predicts that the reinvestment figure will cause the maximal number of pupils to move out of the low quartile if the PSC expenditures take the form of 60% BAS, 20% IO, and 20% SUP.

Summary and Conclusions

This method of analysis differs appreciably from other techniques in that it is based upon information derived directly from the planning, instructional practices, and pupil output conditions of the system. The use of the information gained from the analysis of the qualitative allocation policies provide immediate feedback on whether these judgments were consistent with the general needs of the pupil populations served. If these decisions were inconsistent with the identified pupil needs, the first major effort of reallocation would be to redistribute the program

services to the schools. Once the alignments had been made, management would proceed to the next level of program analysis and planning.

The quantitative allocation procedures would center around the definition and explication of the actual services provided to the pupils. With the three inclusive pupil service component categories (BAS, IO, SUP), management is able to define the delivery of pupil services as monies applied to achieve the implementation of well defined instructional components. Through the processes explained previously, one identifies within the total funding program specific programmatic areas which have evolved through the qualitative allocations and the needs of the total pupil population. Once these programmatic areas or models have been identified, each model is analyzed to ascertain whether specific combinations of the assigned projects demonstrate a maximizing effect on pupil outcomes.

Once these data are obtained and displayed, decisions relative to the composition of PSC proportions made available to the schools, as well as the individual projects, may be ascertained. By choosing the appropriate PSC composition and considering the pupil achievement output that is derived from that configuration of invested projects, a reliable prediction can be made about the amounts of monies that are required to effect a change in the total target group. In addition, estimates of the total monies that must be available to effect changes in increasing numbers of pupils having the same kinds of learning difficulties may be derived.

Programmatically, there appears to be two dimensions associated with the allocation of monies to be used to improve the achievement of

pupils in an educational setting. The first dimension relates to the systematic development of projects which deliver specific instructional content or strategies to the target population. Second, through a process of allocation, these projects are invested in schools at a ratio which is related to (1) the variety of needs the pupil population exhibits and (2) the level of deprivation that is exemplified through their performance characteristics.

The second dimension relates to the identification and quantification of that investment of project configuration which tends to maximize the performance output of the pupils in designated subtarget (model) groups. Using the maximizing condition as an indicator of what could be derived from a condition in which the monies had been invested, an extrapolated figure is derived as a predicted expenditure condition which could increase the productivity of the pupils by a given investment multiple. That is, in a finite population of pupils, if a total investment of $6,000 produced a 50% change at a rate of $100 per pupil, then a total reinvestment of $12,000 should produce the maximal change condition given that the instructional component configuration remains constant.

It would appear that this method for ascertaining cost figures for the improvement of educational outputs would be more accurate and meaningful than others in that the processes and procedures used would have been obtained from the operational base of the system. It also represents a functional budgeting technique in that the total sum would reflect the graduation of program inputs that are required to meet the implicit needs of the populations being served.

REFERENCES

1. Barro, S. M. An approach to developing accountability measures for the public schools. Phi Delta Kappan, 1970, 52(4), 196-205.

2. Durstine, R. M. An accountability information system. Phi Delta Kappan, 1970, 52(4), 236-239.

3. Macleod, R. K. Program budgeting works in nonprofit institutions. Harvard Business Review, 1971, 49(5), 46-56.

4. Block, E. B. Accomplishment/cost: better project control. Harvard Business Review, 1971, 49(3), 110-124.

5. Brown, E. K. A study of ESEA, Title I impact components on urban elementary schools and their pupils. A paper presented at the 1972 Annual Meeting of the American Educational Research Association, 1972. ERIC (ED 061-253)

6. Evaluation of Title I Projects, 1970-1971. Office of Research and Evaluation, School District of Philadelphia, 1971.